IV. RISK MODEL AND RISK-ADJUSTED HOSPITAL MORTALITY RATES—1999

Patients treated at different hospitals may vary in the severity of their pre-operative clinical condition. To fairly compare outcomes at different hospitals, it is necessary to adjust for differences in the case mix of patients across hospitals. CCMRP "levels the playing field" by accounting for the pre-operative condition of each patient. Hospitals that routinely handle complex cases (i.e., sicker at the time of admission) get a larger risk-adjustment weighting in the risk model, while hospitals that handle less complex cases get a smaller weighting. CCMRP intentionally included as risk-adjustment variables only those data elements that describe the patient's condition prior to the heart bypass procedure.

Two sets of models and results are included in the report: 1) the **1999 Analysis** (full four quarters of 1999 data) and 2) the **All Quarters Analysis** (a roll-up of all continuous quarters of data submitted by hospitals for 1997 through 1999).[16] The discussion that follows starts with a presentation of the **1999 Analysis**, followed by the **All Quarters Analysis** and the analysis of the relationship between volume and outcome.

Risk Model Development—1999 Analysis

CCMRP used a multivariate logistic regression model to determine the relationship between each of the demographic and pre-operative risk variables and the likelihood of in-hospital mortality. Multivariate logistic regression models relate the probability of death to the explanatory factor, (e.g., patient age, the amount of creatinine in the blood, or the angina status of the patient) while controlling for all other explanatory factors in the model.

Table 4 presents the final model based on the 1999 dataset. Although the risk-adjustment model is based on data from 81 hospitals, a risk-adjusted score is reported for only 70 hospitals: two hospitals declined to participate in the audit, four hospitals declined to continue participation in the program subsequent to submitting their 1999 data (but prior to viewing any results), and five hospitals withdrew from the program after seeing their results (see Figure 2 in Section II). No unusual patterns of data coding or incompleteness were observed in these 11 hospitals, so their data were retained in the analysis to determine the risk-adjustment model, and this does not appear to bias the model in any way.

The entire dataset was divided randomly into two parts: a "training set" used to develop the model and a "test set" to assess fit. After a final model was chosen and tested, the coefficients were re-estimated using the entire dataset.

The first model tested included all variables that had been used in the 1997/98 CCMRP risk model. However, as described in the previous section, the audit uncovered substantial problems in the coding of the *NYHA CHF Class* and *CCS Angina Class* variables. As a consequence, these two variables were excluded from the final model with no loss of fit and no changes in the performance rankings of hospitals. It appeared that much of the information was already captured in the *CHF* (yes/no) variable.

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[16] All hospitals included in either analysis submitted a minimum of four quarters of data from 1999.

The *Operative Incidence* variable was also modified somewhat in the current analysis. For the 1997/98 model, *Operative Incidence* was modeled with four categories (as opposed to three), the fourth category being "fourth or higher" operation. As none of the patients who experienced four or more operations died in 1999, the category was dropped because its coefficient was not estimable from the data.

Per the policy of CCMRP to encourage complete coding by hospitals and not to unfairly reward hospitals that engage in incomplete coding, missing values were replaced with the lowest risk value. *Age, Ejection Fraction,* and *Creatinine* were entered as continuous variables; the other variables were entered as ordered factors. For the variables entered as ordered factors, the coefficients should be compared to the reference category (for example, the coefficients for the acuity categories 'Urgent,' 'Emergent,' and 'Salvage' are compared to the Reference Group 'Elective').

The CCMRP approach to model selection reflects a decision to include both those factors identified by clinical experts as important predictors of CABG mortality and those that are statistically significant. Rather than focusing on parsimony, the CCMRP goal is to develop a clinically sound model that predicts well.

Table 4: Logistic Regression Risk Model, 1999 Analysis						
Explanatory Factor		**Coefficient**	**Standard Error**	**p-value**	**Significance**	**Odds Ratio**
Intercept		-8.81	0.49	0.000	***	
Age (Years)		0.06	0.01	0.000	***	1.07
Gender	Female	Reference Group				
	Male ^	-0.45	0.09	0.000	***	0.64
Race	White ^*	Reference Group				
	Non-White	0.05	0.10	0.614		1.05
Creatinine (mg/dl)		0.19	0.05	0.000	***	1.21
Congestive Heart Failure	Present	0.54	0.10	0.000	***	1.72
Hypertension	Present	0.21	0.11	0.052		1.23
Dialysis	Yes	0.57	0.30	0.052		1.78
Diabetes	Present	0.20	0.09	0.029	*	1.23
Peripheral Vascular Disease	Present	0.20	0.11	0.071		1.22
Cerebrovascular Disease	Present	0.27	0.11	0.015	*	1.31
Ventricular Arrhythmia	Present	0.38	0.16	0.015	*	1.47
COPD	Present	0.33	0.11	0.003	**	1.40
Operative Incidence	First Operation ^	Reference Group				
	Second	0.82	0.13	0.000	***	2.26
	Third or Higher	1.25	0.30	0.000	***	3.50
Myocardial Infarction	None ^	Reference Group				
	Yes, but when unknown	-0.01	0.41	0.980		0.99
	21+ days ago	0.26	0.12	0.031	*	1.30
	7-20 days ago	0.57	0.17	0.001	**	1.77
	1-6 days ago	0.13	0.12	0.297		1.14
	Within 1 day	0.73	0.18	0.000	***	2.09
PTCA on this Admission	Yes	0.19	0.13	0.150		1.21
Angina	None	Reference Group				
	Stable ^	-0.37	0.16	0.027	*	0.69
	Unstable	0.06	0.14	0.663		1.06
Acuity	Elective ^	Reference Group				
	Urgent	0.32	0.11	0.004	**	1.38
	Emergent	1.38	0.15	0.000	***	3.96
	Salvage	3.14	0.28	0.000	***	23.12
Ejection Fraction (%)		-0.01	0.00	0.000	***	0.99
Left Main Stenosis (%)	50% or less^	Reference Group				
	51% to 70%	0.11	0.14	0.423		1.12
	71% to 90%	0.35	0.14	0.010	*	1.43
	91% or more	0.44	0.19	0.019	*	1.55
Number of Diseased Vessels	Single Vessel	Reference Group				
	Double Vessel ^	0.01	0.23	0.953		1.01
	Triple Vessel or More	0.15	0.21	0.496		1.16
	None (Left Main Stenosis only)	-0.72	0.76	0.346		0.49
Mitral Insufficiency	None ^	Reference Group				
	Trivial	0.05	0.18	0.792		1.05
	Mild	0.19	0.15	0.211		1.21
	Moderate	0.28	0.24	0.244		1.32
	Severe	0.20	0.55	0.720		1.22

Note: ^ refers to the specific category used to replace missing data for each variable.

Guide to Interpreting the Risk Model

Coefficient: The coefficient for each explanatory factor represents the effect that factor has on a patient's likelihood of dying (in the hospital) following bypass surgery. If the value is positive, it means that the characteristic is associated with an increased risk of death compared to not having the characteristic—while controlling for the effect of all of the other factors. If the coefficient is negative, having that characteristic is associated with a lower risk of death compared to not having it. The larger the value (whether positive or negative), the greater the effect or weight this characteristic has on the risk of dying. For example, note that the coefficient for "Congestive Heart Failure" in the 1999 model is 0.54 and statistically significant. This value is positive, so it indicates that CABG patients with congestive heart failure are at an increased risk of dying compared to patients that do not have the disease. On the other hand, the coefficient for the variable "Male" has a value of – 0.45. Since the value is negative, males have a lower probability of dying than females, after taking into account all other factors.

Standard Error: The standard error is the standard deviation of the sampling distribution of an estimate. It measures the statistical reliability of that estimate.

p–value: The p-value is a measure of the statistical significance of the coefficient compared to the reference category. Commonly, p-values of less than 0.05 are considered statistically significant. The smaller the p-value, the more likely the effect of a factor is real, rather than due to chance.

Significance: When the p-value of a coefficient is less than 0.05, it is deemed statistically significant at the 0.05 level and is denoted with one star (*) in the Significance column. Two stars (**) indicate statistical significance at the 0.01 level, and three stars (***) indicate statistical significance at the 0.001 level. All statistical tests are two-tailed tests.

Odds Ratio: An odds ratio is another way of characterizing the impact of each factor on in-hospital mortality. Mathematically, the odds ratio is the antilogarithm of the coefficient value. The larger the odds ratio, the greater the impact that characteristic has on the risk of dying. An odds ratio close to 1.0 means the effect of the factor is close to neutral. For example, the odds ratio for congestive heart failure (CHF) in the 1999 model is 1.72. This means that for patients with CHF, the odds of dying in-hospital are about 1.72 times higher compared to patients without CHF, assuming all other risk factors are the same. Males have an odds ratio of 0.64, which means that the odds that a man will die in-hospital after CABG surgery is about 0.64 times as high (i.e., about two thirds as much) as for a woman, assuming all other risk factors are the same.

Key Findings Regarding the Risk Model

- Although several of the variables do not appear to be "statistically significant" (as determined by the p-value), almost all coefficients appear with the expected sign from a clinical standpoint.

- *Age, Acuity* (i.e., urgency of the operation), *Ejection Fraction, Creatinine,* and *Operative Incidence* are the most important risk-model variables.

- Even after controlling for all other variables, *Gender* has a statistically significant effect, with males having about one-third lower mortality. There is some suggestion in the literature that *Gender* may be a proxy for body size.

- Experiencing *Myocardial Infarction* within 24 hours prior to CABG surgery more than doubles a patient's risk of in-hospital death.

- The degree of *Left Main Stenosis* significantly increases the risk of dying, particularly when 71% or greater.

- Of the comorbidities collected, *Congestive Heart Failure* has the largest effect.

Risk-Adjusted Mortality Rates–1999 Analysis

The logistic regression model in Table 4 was used to develop risk-adjusted mortality rates for each of the participating hospitals. Among hospitals participating in public reporting, 515 patients out of a total of 18,673 died in-hospital, reflecting an overall in-hospital death rate of 2.76%. This compares to an overall rate of 2.9% nationally for 1999 as reported by the Society of Thoracic Surgeons for 30-day operative mortality (see www.sts.org). Because some deaths occur after discharge but within 30 days, 30-day operative mortality is slightly higher than in-hospital mortality.

The **1999 Analysis** revealed that of the 70 hospital participants, three performed significantly "worse than expected" (i.e. their actual death rate was higher than what was expected/predicted), none performed "better than expected," and 67 performed "as expected." Because of the low mortality rate associated with bypass surgery (fewer than 3 deaths for every 100 cases in 1999), it is very difficult for hospitals to distinguish themselves as "better than expected" performers, which partly explains why there are no "better than expected" performers, but a number of "worse than expected" performers. This is especially true when only looking at a single year's worth of data, where confidence intervals can be quite wide for hospitals with low annual volumes of CABG cases. Given that California has many hospitals with small annual case volumes, this makes it more difficult to identify statistical outliers.

Table 5 and Figure 3 below present the risk-adjusted results for each of the 70 CCMRP participants in 1999. Table 5 displays the results alphabetically. Figure 3 shows the results graphically, sorted alphabetically within geographic region.

How to Read the Tables

***Number of CABG cases submitted*:** The number of isolated CABG cases the hospital submitted to CCMRP for full calendar year 1999.

***Number of observed deaths*:** The hospital's <u>actual</u> number of in-hospital deaths for isolated CABG patients in 1999. This number does not include patients who died after transfer or discharge from the facility.

Number of expected deaths: CCMRP used the risk-adjustment model to calculate the probability of in-hospital death for each one of the cases included in the 1999 risk model. CCMRP staff then summed the probabilities for all cases at each hospital to calculate the number of in-hospital deaths expected at the hospital given its case mix. Example: Hospital X had 150 patients, 100 of whom had a 1% probability of death, 40 of whom had a 4% probability of death, and 10 with a 9% probability of death, the total number of expected deaths would be 3.5 (i.e., (100)(1%) + (40)(4%) + (10)(9%) = 1 + 1.6 + 0.9 = 3.5 expected deaths). Note that the number of expected deaths can be a fractional number, unlike the number of observed deaths— which can only be a whole number.

O/E ratio: ***The observed to expected mortality ratio:*** The O/E ratio is the number of observed deaths (numerator), divided by the number of expected deaths (denominator) as predicted from the risk-adjustment model. Example, if the observed number of deaths was 18 and the predicted number of deaths was 21.36, then the O/E ratio would be 18/21.36=0.84. An O/E ratio greater than 1.0 means that the hospital had more deaths than would have been expected given the case-mix of its patients. An O/E ratio lower than 1.0 means that the hospital had fewer deaths than would have been expected given the case-mix of its patients. Small differences in the O/E ratio are usually not significant. The performance rating a hospital receives is not based on the O/E ratio, but instead on whether the actual death rate falls within the 95% confidence range of the "expected death rate." Thus, hospitals that have O/E ratios of less than or greater than one are not classified as "better than" or "worse than" expected unless the result has also been found to be statistically significant.

Observed death rate: This is the actual death rate for the hospital. It is calculated by dividing the number of observed deaths (numerator) for the hospital by the total number of cases for the hospital (denominator). For example, if the hospital had 250 isolated CABG cases, with seven actual in-hospital deaths, the observed death rate would be 7/250 = 2.8%.

Expected death rate: The number of "expected" or predicted deaths from the risk model (numerator) is divided by the number of cases (denominator) to derive the expected death rate. If the hospital had 250 isolated CABG cases and an expected number of in-hospital deaths of 8.2, the *expected death rate* would be 8.2/250 = 3.28%. Note that the expected death rate is a measure of the average severity of illness of each hospital's isolated CABG patients: the higher the expected rate, the higher the average severity. The average death rate for the entire 1999 dataset is 2.83%[17], so if a hospital's expected death rate is higher than 2.83%, the hospital's isolated CABG patients tend to be higher risk than the overall population of CABG patients in CCMRP's dataset.

Lower and upper confidence intervals on the expected death rate: Confidence intervals provide a measure of the confidence regarding the estimate of the "expected" death rate. A lower confidence limit bound on the expected rate is computed by subtracting twice the standard deviation from the expected rate. Similarly, the upper bound is calculated by adding twice the standard deviation to the expected rate. Two standard deviations (2SD) below and above the expected rate is an approximate 95% confidence interval. The range that is bounded by the upper and lower intervals can be interpreted as 95 out of 100 times, the "true expected death rate" would fall within that range. Smaller intervals mean that we have more confidence in our estimate. The width of the confidence interval depends both on the number of cases that

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[17] The 1999 risk model is based on data from 81 hospitals that submitted data to CCMRP for 1999; although only 70 hospitals ultimately agreed to public reporting. The death rate of 2.83% is that for the complete set of data included in the 1999 risk model— 21,973 cases from the 81 hospitals that submitted data.

a hospital submitted, and the variability of the difference in the risks for the hospital's isolated CABG patients. A hospital with a larger number of cases will have a narrower confidence interval than a hospital with fewer cases. Because there is a great deal of variability in patient risks, the CCMRP model calculates the standard deviation based on the predictions of risk for each patient rather than using the average risk over all patients at each hospital.

Overall performance rating: The hospital's overall performance rating is based on a comparison of each facility's *observed death rate* to the 95% confidence interval around the hospital's *expected death rate*. This is a test of statistical significance. Effectively, hospitals are only classified as "better" or "worse" than expected if their *observed mortality rate* falls outside the 95% confidence interval of the *expected death rate*. CCMRP splits all hospitals into one of three groups:

- **Worse than expected**—the observed death rate is <u>higher</u> than the <u>upper</u> bound of the 95% confidence interval of the expected death rate.

- **Better than expected**—the observed death rate is <u>lower</u> than the <u>lower</u> bound of the 95% confidence interval of the expected death rate.

- **No different than expected**—the observed death rate falls <u>within</u> the 95% confidence interval of the expected death rate.

Table 5: Risk-Adjusted Results for CCMRP Hospitals, 1999, Sorted Alphabetically								
Hospital Name	CABG Cases Submitted	Number of Observed Deaths	Number of Expected Deaths	O/E Ratio	Observed Death Rate	Lower 95% CI of Expected Death Rate	Expected Death Rate	Upper 95% CI of Expected Death Rate	Overall Performance Rating
Alta Bates Medical Center	96	4	2.62	1.53	4.17	0.00	2.73	5.84	No Different
Alvarado Hospital Medical Center	148	6	6.01	1.00	4.05	1.04	4.06	7.08	No Different
CA Pacific Medical Center-Pacific Campus	172	4	6.00	0.67	2.33	0.98	3.49	6.00	No Different
Cedars-Sinai Medical Center	352	9	11.05	0.81	2.56	1.43	3.14	4.85	No Different
Community Mem. Hosp. of San Buenaventura	188	4	3.87	1.03	2.13	0.08	2.06	4.04	No Different
Dameron Hospital	109	6	4.39	1.37	5.50	0.66	4.03	7.40	No Different
Daniel Freeman Memorial Hospital	156	6	4.11	1.46	3.85	0.24	2.64	5.03	No Different
Desert Regional Medical Center	133	9	3.81	2.36	6.77	0.15	2.86	5.57	Worse Than Expected
Doctor's Medical Center - Modesto	508	12	9.53	1.26	2.36	0.74	1.88	3.01	No Different
Doctor's Medical Center - San Pablo	81	0	2.29	0.00	0.00	0.00	2.82	6.30	No Different
Dominican Hospital	160	4	4.24	0.94	2.50	0.30	2.65	5.00	No Different
El Camino Hospital	108	3	4.55	0.66	2.78	1.10	4.22	7.34	No Different
Encino Tarzana Regional Medical Center	172	7	6.75	1.04	4.07	1.16	3.92	6.69	No Different
Glendale Adventist Med Ctr - Wilson Terrace	267	11	7.02	1.57	4.12	0.79	2.63	4.47	No Different
Glendale Memorial Hospital and Health Center	178	7	7.26	0.96	3.93	1.34	4.08	6.82	No Different
Granada Hills Community Hospital	72	2	1.72	1.16	2.78	0.00	2.40	5.85	No Different
Green Hospital of Scripps Clinic	229	4	2.93	1.36	1.75	0.00	1.28	2.71	No Different
Heart Hospital of the Desert	87	0	2.83	0.00	0.00	0.00	3.25	6.79	No Different
Hoag Memorial Hospital Presbyterian	255	9	11.11	0.81	3.53	2.04	4.36	6.68	No Different
John Muir Medical Center	126	6	6.76	0.89	4.76	1.79	5.36	8.93	No Different

Table 5: Risk-Adjusted Results for CCMRP Hospitals, 1999, Sorted Alphabetically

Hospital Name	CABG Cases Submitted	Number of Observed Deaths	Number of Expected Deaths	Ratio	Observed Death Rate	Lower 95% CI of Expected Death Rate	Expected Death Rate	Upper 95% CI of Expected Death Rate	Overall Performance Rating
Kaiser Foundation Hospital - Los Angeles	1597	23	26.83	0.86	1.44	1.07	1.68	2.29	No Different
Kaiser Foundation Hospital - San Francisco	1282	23	22.50	1.02	1.79	1.07	1.75	2.44	No Different
Kaweah Delta Hospital	402	10	12.99	0.77	2.49	1.57	3.23	4.89	No Different
Loma Linda University Medical Center	402	6	11.94	0.50	1.49	1.38	2.97	4.56	No Different
Long Beach Memorial Medical Center	363	13	12.57	1.03	3.58	1.66	3.46	5.26	No Different
Marin General Hospital	67	4	1.65	2.42	5.97	0.00	2.47	5.82	Worse Than Expected
Memorial Medical Center of Modesto	299	10	6.18	1.62	3.34	0.48	2.07	3.66	No Different
Mercy Medical Center - Redding	216	8	8.17	0.98	3.70	1.39	3.78	6.17	No Different
Methodist Hospital of Southern California	282	4	6.19	0.65	1.42	0.54	2.20	3.85	No Different
Mission Hospital and Regional Medical Center	237	6	4.60	1.30	2.53	0.22	1.94	3.66	No Different
Palomar Medical Center	115	5	3.39	1.47	4.35	0.00	2.95	5.99	No Different
Presbyterian Intercommunity Hospital	73	1	1.47	0.68	1.37	0.00	2.01	5.20	No Different
Providence Holy Cross Medical Center	106	2	3.69	0.54	1.89	0.34	3.48	6.63	No Different
Providence St. Joseph Medical Center	192	4	4.69	0.85	2.08	0.32	2.44	4.57	No Different
Redding Medical Center	518	6	9.53	0.63	1.16	0.70	1.84	2.98	No Different
Saddleback Memorial Medical Center	132	8	4.76	1.68	6.06	0.50	3.60	6.71	No Different
Salinas Valley Memorial Hospital	323	8	8.97	0.89	2.48	1.04	2.78	4.52	No Different
San Antonio Community Hospital	120	3	5.57	0.54	2.50	1.12	4.64	8.16	No Different
San Jose Medical Center	66	2	1.71	1.17	3.03	0.00	2.59	6.14	No Different
Santa Barbara Cottage Hospital	272	6	7.40	0.81	2.21	0.87	2.72	4.57	No Different
Santa Monica - UCLA Hospital Med Ctr	58	2	3.72	0.54	3.45	0.64	6.41	12.18	No Different

Table 5: Risk-Adjusted Results for CCMRP Hospitals, 1999, Sorted Alphabetically

Hospital Name	CABG Cases Submitted	Number of Observed Deaths	Number of Expected Deaths	O/E Ratio	Observed Death Rate	Lower 95% CI of Expected Death Rate	Expected Death Rate	Upper 95% CI of Expected Death Rate	Overall Performance Rating
Santa Rosa Memorial Hospital	187	9	9.10	0.99	4.81	2.05	4.87	7.69	No Different
Scripps Memorial Hospital - La Jolla	424	11	14.64	0.75	2.59	1.78	3.45	5.12	No Different
Scripps Mercy	256	16	8.96	1.79	6.25	1.35	3.50	5.64	Worse Than Expected
Sequoia Hospital	234	7	8.51	0.82	2.99	1.38	3.64	5.89	No Different
Seton Medical Center-Heart Institute	481	12	10.49	1.14	2.49	0.91	2.18	3.45	No Different
Sharp Chula Vista Medical Center	290	6	9.41	0.64	2.07	1.27	3.24	5.22	No Different
Sharp Grossmont Hospital	148	3	3.48	0.86	2.03	0.00	2.35	4.76	No Different
Sharp Memorial Hospital	251	12	7.09	1.69	4.78	0.87	2.82	4.78	No Different*
St. Bernardine Medical Center	557	14	15.65	0.89	2.51	1.48	2.81	4.14	No Different
St. Francis Medical Center	96	1	3.32	0.30	1.04	0.00	3.45	6.98	No Different
St. Helena Hospital	261	10	9.76	1.02	3.83	1.56	3.74	5.92	No Different
St. John's Hospital & Health Ctr - Santa Monica	148	6	5.56	1.08	4.05	1.01	3.76	6.51	No Different
St. Joseph Hospital - Orange	313	4	8.13	0.49	1.28	0.92	2.60	4.27	No Different
St. Joseph's Medical Center of Stockton	269	7	7.43	0.94	2.60	0.91	2.76	4.61	No Different
St. Jude Medical Center	293	10	7.30	1.37	3.41	0.85	2.49	4.13	No Different
St. Mary's Hospital and Medical Center - SF	553	10	16.77	0.60	1.81	1.65	3.03	4.41	No Different
St. Vincent Medical Center	282	9	8.17	1.10	3.19	1.02	2.90	4.78	No Different
Stanford University Hospital	221	7	6.99	1.00	3.17	0.94	3.16	5.38	No Different
Summit Medical Center	197	7	9.61	0.73	3.55	2.37	4.88	7.39	No Different
Sutter Memorial Hospital	623	12	19.10	0.63	1.93	1.76	3.07	4.37	No Different
The Hosp of the Good Samaritan - Los Angeles	649	25	26.58	0.94	3.85	2.65	4.10	5.55	No Different

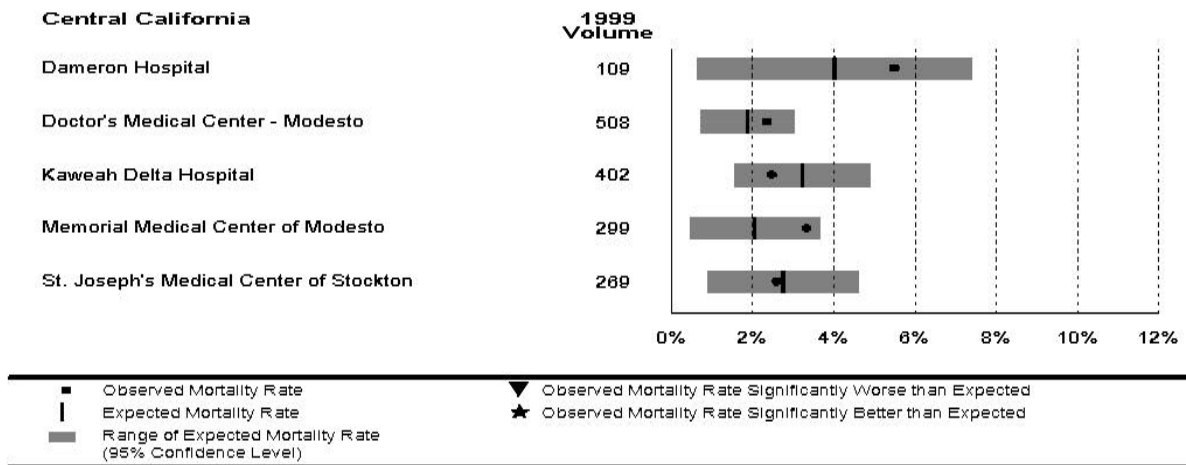## Table 5: Risk-Adjusted Results for CCMRP Hospitals, 1999, Sorted Alphabetically

Hospital Name	CABG Cases Submitted	Number of Observed Deaths	Number of Expected Deaths	O/E Ratio	Observed Death Rate	Lower 95% CI of Expected Death Rate	Expected Death Rate	Upper 95% CI of Expected Death Rate	Overall Performance Rating
Torrance Memorial Medical Center	202	7	5.60	1.25	3.47	0.65	2.77	4.89	No Different
Tri-City Medical Center	196	4	5.11	0.78	2.04	0.54	2.61	4.67	No Different
UC Irvine Medical Center	70	3	2.05	1.46	4.29	0.00	2.93	6.69	No Different
UCD Medical Center	169	4	4.21	0.95	2.37	0.26	2.49	4.73	No Different
UCLA Medical Center	177	8	6.24	1.28	4.52	1.04	3.53	6.02	No Different
UCSF Medical Center	134	5	3.06	1.63	3.73	0.00	2.28	4.67	No Different
USC University Hospital	105	6	3.12	1.93	5.71	0.00	2.97	6.13	No Different
Washington Hospital - Fremont	168	13	10.51	1.24	7.74	3.09	6.25	9.42	No Different

Note: *Sharp Memorial Hospital had an observed death rate of 4.781 and the upper 95% CI of the expected death rate was 4.778.

Figure 3: Comparison of Observed to Expected Mortality Rate, 1999
(in Alphabetical Order by Geographical Region)

Central California	1999 Volume
Dameron Hospital	109
Doctor's Medical Center - Modesto	508
Kaweah Delta Hospital	402
Memorial Medical Center of Modesto	299
St. Joseph's Medical Center of Stockton	269

0%   2%   4%   6%   8%   10%   12%

■ Observed Mortality Rate
| Expected Mortality Rate
▬ Range of Expected Mortality Rate (95% Confidence Level)

▼ Observed Mortality Rate Significantly Worse than Expected
★ Observed Mortality Rate Significantly Better than Expected

NOTE: The following hospitals in this region declined to participate:
Bakersfield Memorial Hospital, Fresno Community Hospital and Medical Center,
Marian Medical Center, San Joaquin Community Hospital, St. Agnes Medical Center.

Figure 3: Comparison of Observed to Expected Mortality Rate, 1999
(cont.)   (in Alphabetical Order by Geographical Region)

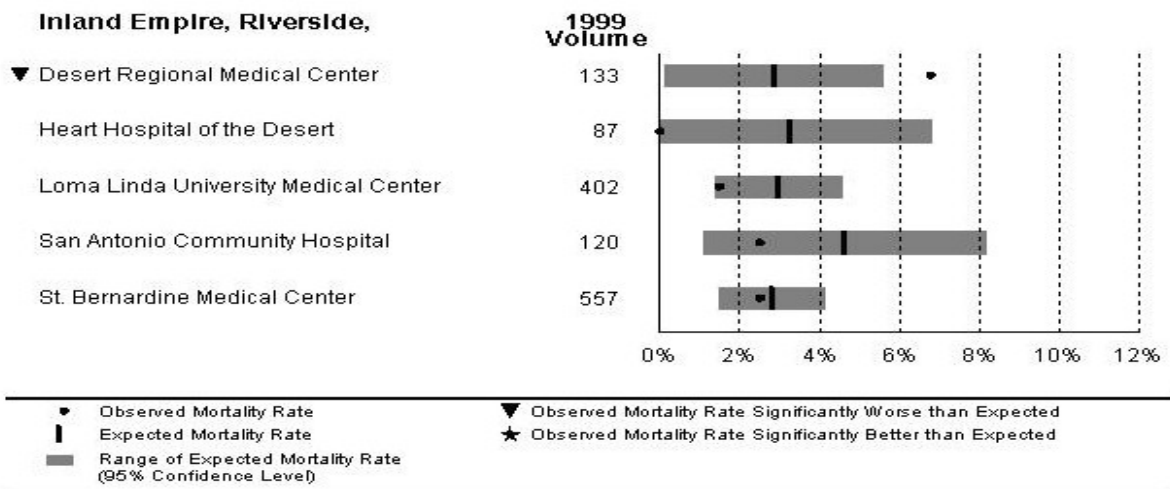| Greater Los Angeles Area	1999 Volume
Cedars-Sinai Medical Center	352
Daniel Freeman Memorial Hospital	156
Kaiser Foundation Hospital – Los Angeles	1,597
Long Beach Memorial Medical Center	363
Methodist Hospital of Southern California	282
Presbyterian Intercommunity Hospital	73
Santa Monica-UCLA Hospital Medical Center	58
St. Francis Medical Center	96
St. John's Hospital and Health Center - Santa Monica	148
St. Vincent Medical Center	282
The Hospital of the Good Samaritan	649
Torrance Memorial Medical Center	202
UCLA Medical Center	177
USC University Hospital	105

0%   2%   4%   6%   8%   10%   12%

• Observed Mortality Rate
| Expected Mortality Rate
▬ Range of Expected Mortality Rate (95% Confidence Level)

▼ Observed Mortality Rate Significantly Worse than Expected
★ Observed Mortality Rate Significantly Better than Expected

NOTE: The following hospitals in this region declined to participate:
Beverly Hospital, Brotman Medical Center, Centinela Hospital Medical Center,
Downey Community Hospital, Garfield Medical Center, Huntington Memorial Hospital,
Intercommunity/Citrus Valley Medical Center, LA County, Harbor-UCLA Medical Center,
LA County/USC Medical Center, Lakewood Regional Medical Center,
Little Company of Mary, St. Mary's Medical Center - Long Beach,
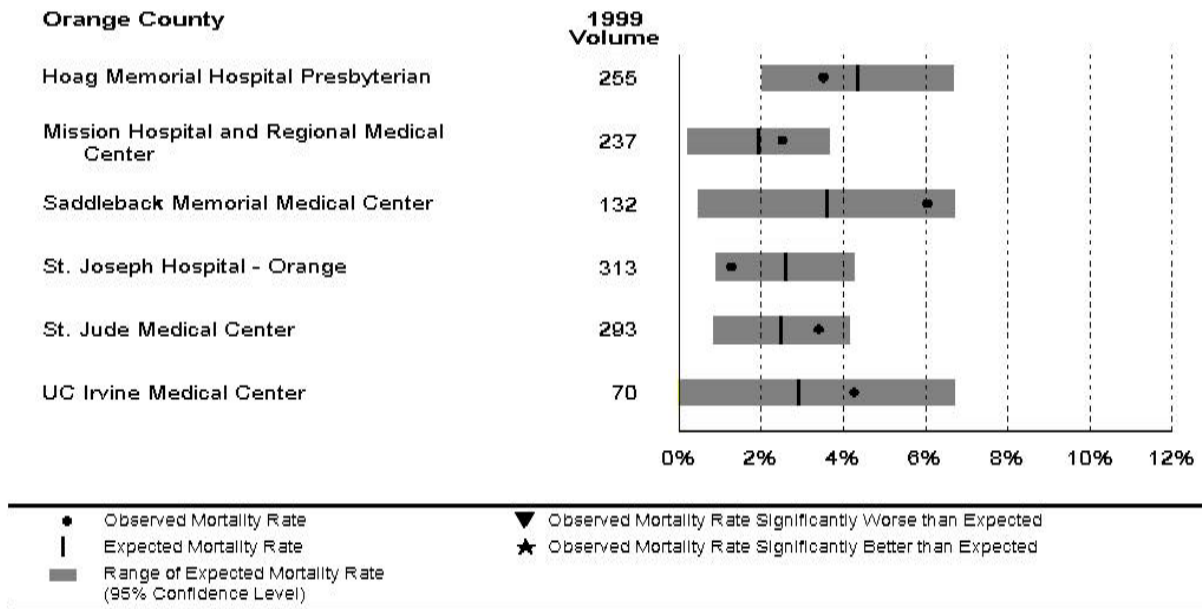White Memorial Medical Center.

Figure 3: Comparison of Observed to Expected Mortality Rate, 1999
(cont.)   (in Alphabetical Order by Geographical Region)

Inland Empire, Riverside,	1999 Volume
▼ Desert Regional Medical Center	133
Heart Hospital of the Desert	87
Loma Linda University Medical Center	402
San Antonio Community Hospital	120
St. Bernardine Medical Center	557

0%   2%   4%   6%   8%   10%   12%

- ● Observed Mortality Rate
- ▌ Expected Mortality Rate
- ▬ Range of Expected Mortality Rate (95% Confidence Level)
- ▼ Observed Mortality Rate Significantly Worse than Expected
- ★ Observed Mortality Rate Significantly Better than Expected

NOTE: The following hospitals in this region declined to participate:
Eisenhower Medical Center, Pomona Valley Hospital and Medical Center,
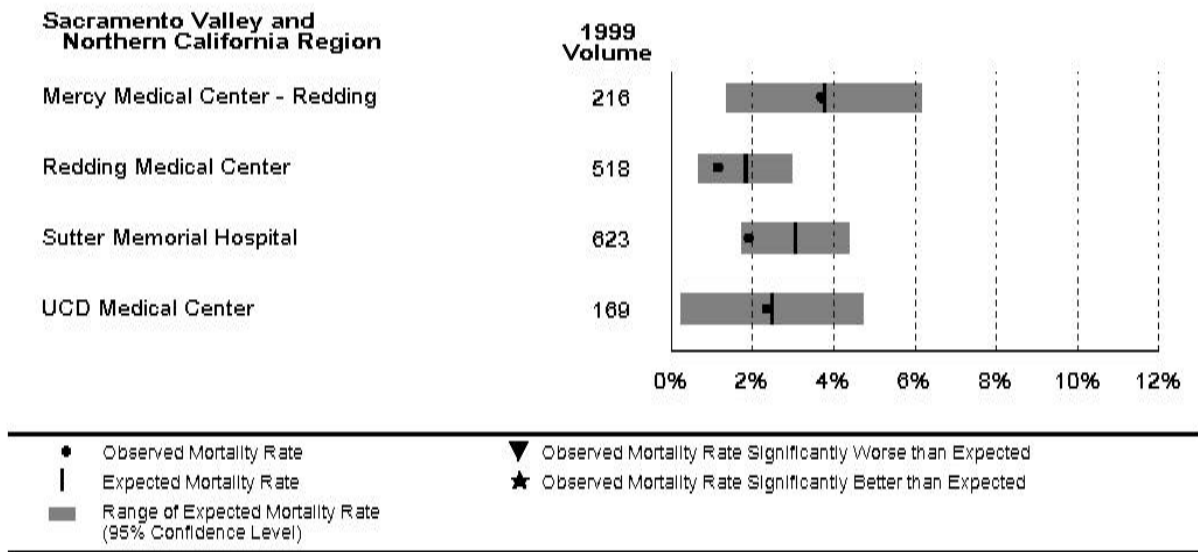Riverside Community Medical Center, St. Mary's Regional Medical Center.

Figure 3: Comparison of Observed to Expected Mortality Rate, 1999
(cont.)   (in Alphabetical Order by Geographical Region)

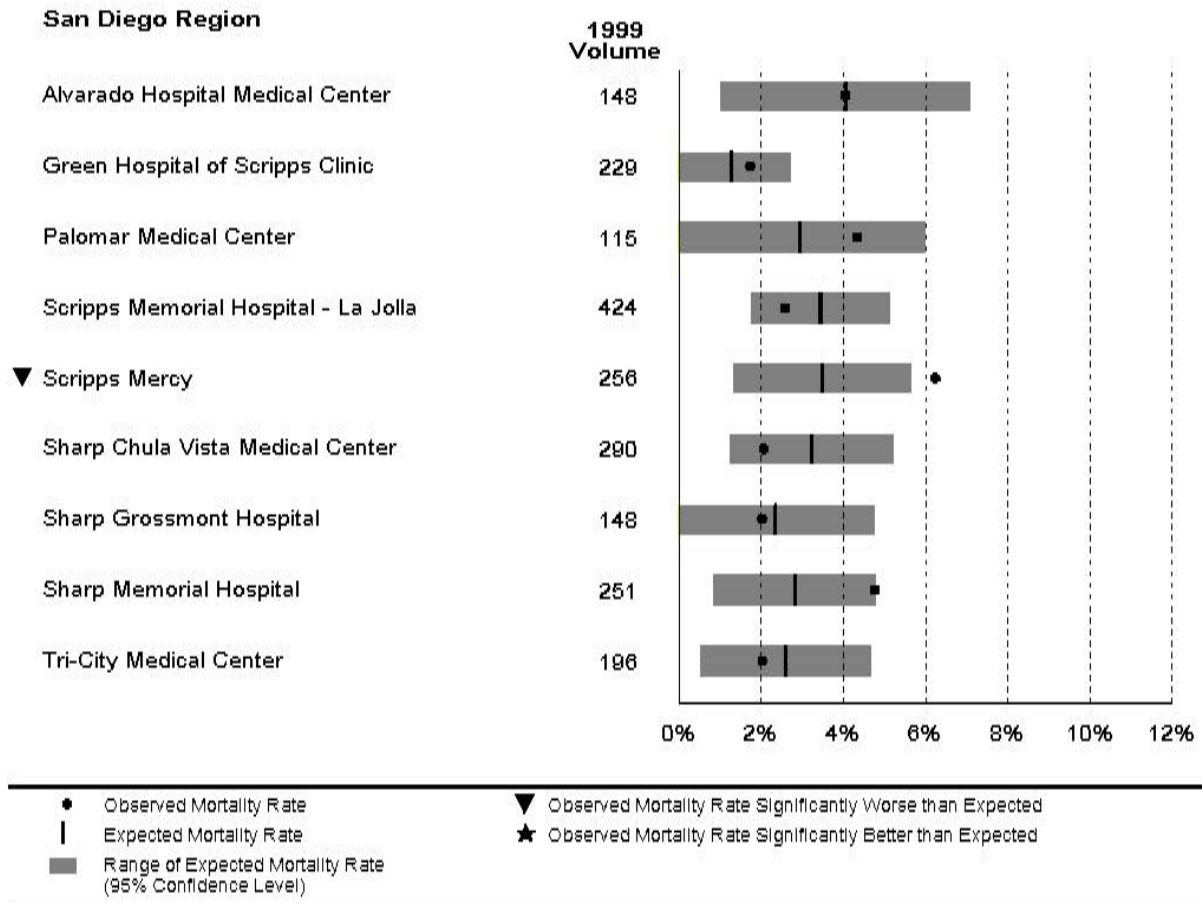NOTE: The following hospitals in this region declined to participate:
Anaheim Memorial Medical Center, Fountain Valley Regional Hospital,
West Anaheim Medical Center, Western Medical Center - Anaheim,
Western Medical Center - Santa Ana.

Figure 3: Comparison of Observed to Expected Mortality Rate, 1999
(cont.)   (in Alphabetical Order by Geographical Region)

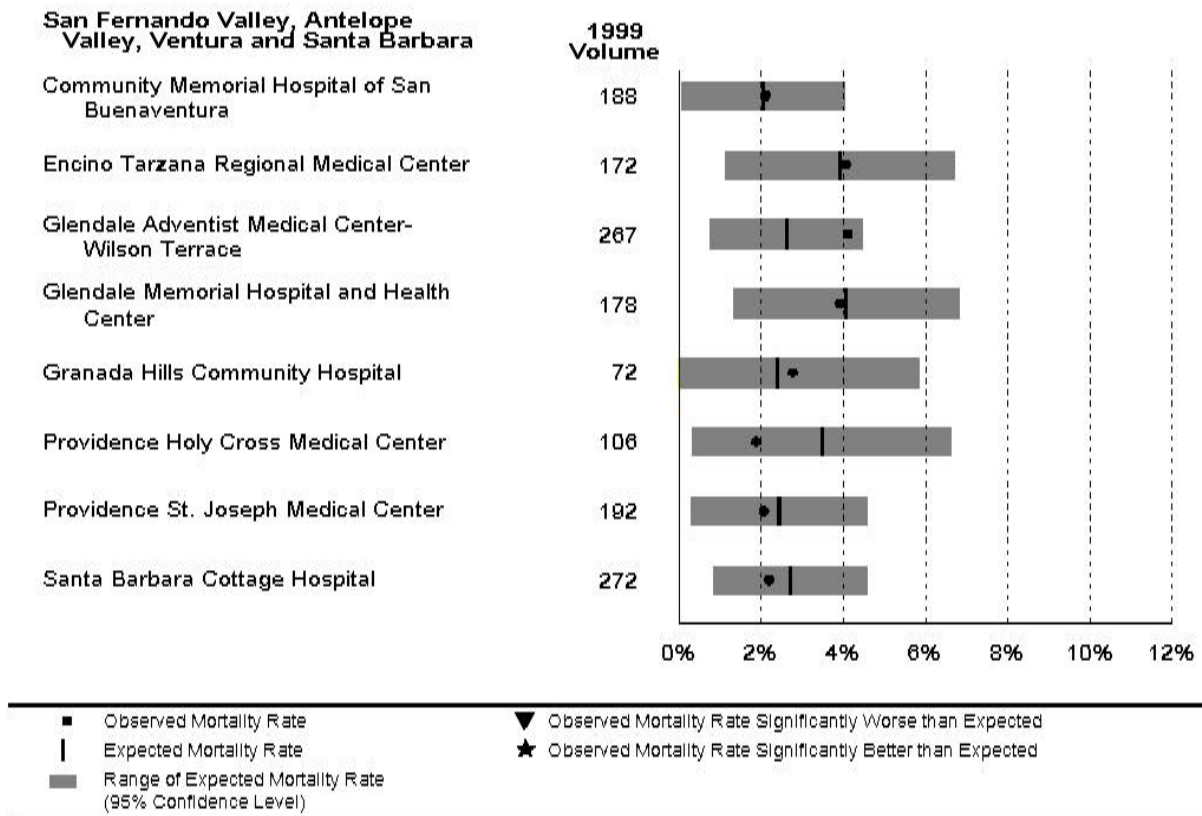NOTE: The following hospitals in this region declined to participate:
Enloe Medical Center, Mercy General Hospital, Mercy San Juan Hospital.

Figure 3: Comparison of Observed to Expected Mortality Rate, 1999
(cont.)   (in Alphabetical Order by Geographical Region)

NOTE: The following hospitals in this region declined to participate:
UCSD Medical Center - Hillcrest, UCSD Medical Center - Thornton.

41

Figure 3: Comparison of Observed to Expected Mortality Rate, 1999
(cont.)   (in Alphabetical Order by Geographical Region)

NOTE: The following hospitals in this region declined to participate:
Antelope Valley Hospital Medical Center, French Hospital - San Luis Obispo,
Lancaster Community Hospital, Los Robles Regional Medical Center,
Northridge Hospital Medical Center, St. John's Regional Medical Center - Oxnard,
Valley Presbyterian Hospital, West Hills Regional Medical Center.

Figure 3: Comparison of Observed to Expected Mortality Rate, 1999
(cont.)   (in Alphabetical Order by Geographical Region)
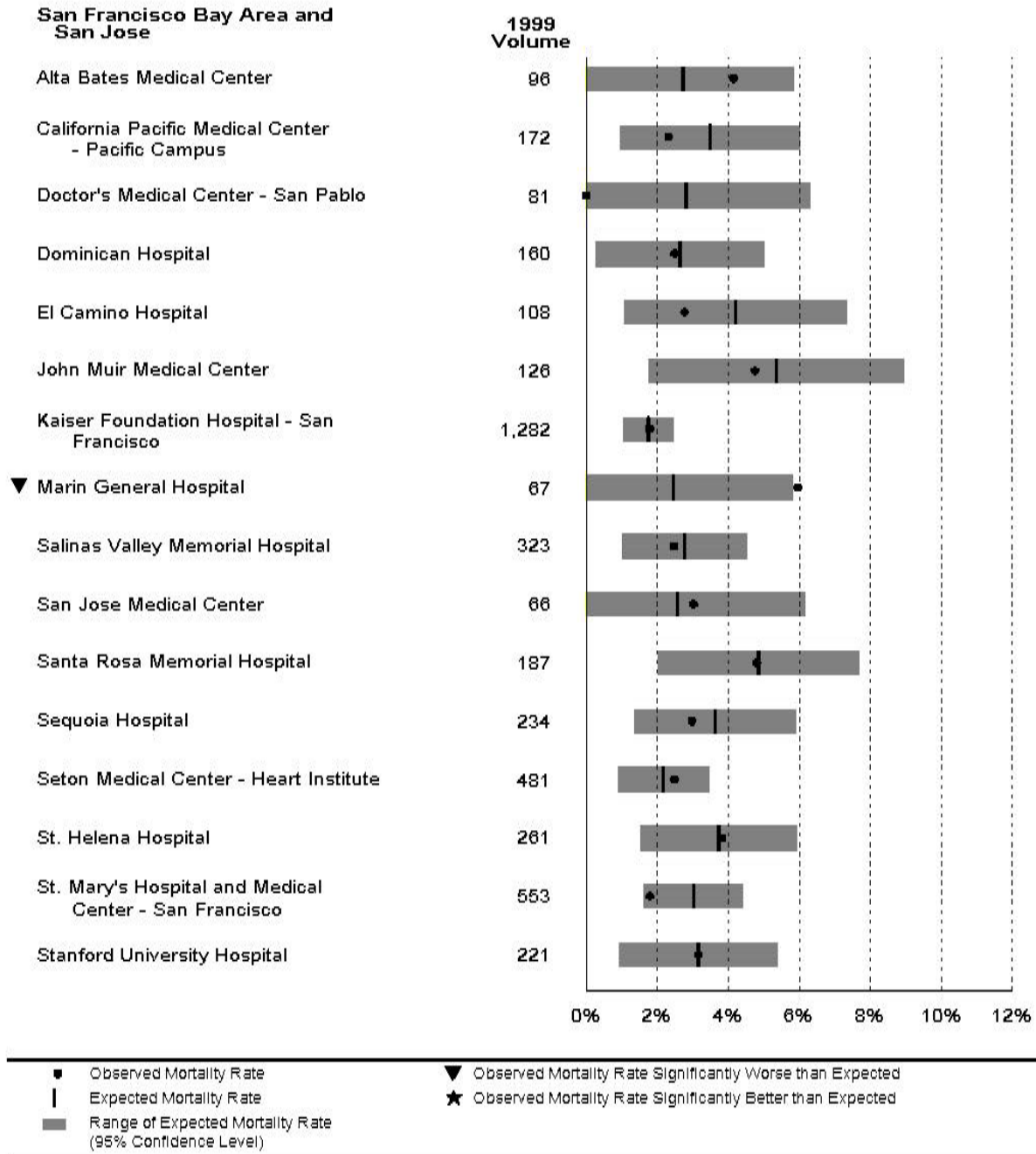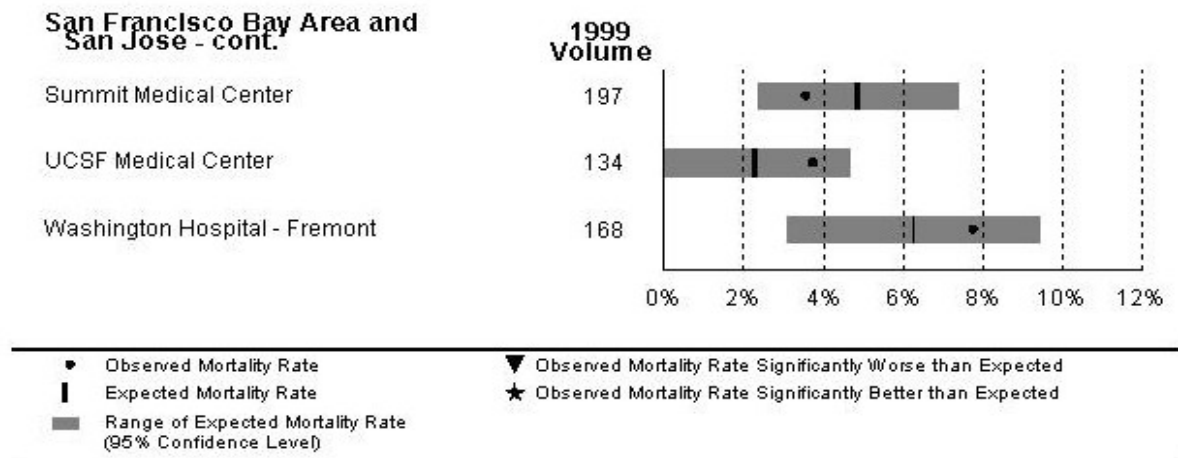

San Francisco Bay Area and San Jose	1999 Volume
Alta Bates Medical Center	96
California Pacific Medical Center - Pacific Campus	172
Doctor's Medical Center - San Pablo	81
Dominican Hospital	160
El Camino Hospital	108
John Muir Medical Center	126
Kaiser Foundation Hospital - San Francisco	1,282
▼ Marin General Hospital	67
Salinas Valley Memorial Hospital	323
San Jose Medical Center	66
Santa Rosa Memorial Hospital	187
Sequoia Hospital	234
Seton Medical Center - Heart Institute	481
St. Helena Hospital	261
St. Mary's Hospital and Medical Center - San Francisco	553
Stanford University Hospital	221

• Observed Mortality Rate
| Expected Mortality Rate
▬ Range of Expected Mortality Rate (95% Confidence Level)

▼ Observed Mortality Rate Significantly Worse than Expected
★ Observed Mortality Rate Significantly Better than Expected

NOTE: The following hospitals in this region declined to participate:
Good Samaritan Hospital - San Jose, Mt. Diablo Medical Center, O'Conner Hospital, Queen of the Valley Hospital, Santa Clara Valley Medical Center, Mills-Peninsula Hospital.

Figure 3: Comparison of Observed to Expected Mortality Rate, 1999
(cont.)   (in Alphabetical Order by Geographical Region)

San Francisco Bay Area and San Jose - cont.	1999 Volume
Summit Medical Center	197
UCSF Medical Center	134
Washington Hospital - Fremont	168

- • Observed Mortality Rate
- I Expected Mortality Rate
- ▬ Range of Expected Mortality Rate (95% Confidence Level)
- ▼ Observed Mortality Rate Significantly Worse than Expected
- ★ Observed Mortality Rate Significantly Better than Expected

NOTE: The following hospitals in this region declined to participate:
Good Samaritan Hospital - San Jose, Mt. Diablo Medical Center, O'Conner Hospital, Queen of the Valley Hospital, Santa Clara Valley Medical Center, Mills-Peninsula Hospital.